



# STATE OF NEW HAMPSHIRE DEPARTMENT OF SAFETY

Richard M. Flynn, Commissioner

**Division of Fire Safety**  
**Office of the State Fire Marshal**  
J. William Degnan, State Fire Marshal



**Bureau of Electrical Safety and Licensing**  
Office: 2 Industrial Park Drive, Building 2, Concord, NH  
Mailing Address: 33 Hazen Drive, Concord, N.H. 03305  
603-271-3748, FAX 603-271-2257

## **TECHNICAL BULLETIN AND POLICY**

### **Installation of Wiring Methods Below Roof Decks**

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**As of January 1, 2006 the policy of the Bureau of Electrical Safety and Licensing is to uniformly determine that the open areas of the underside of metal roof decks, in other than residential construction, are areas: “where, during installation or afterward, will be subject to severe physical damage.”** Any wiring method not suitable for those areas considered as subject to severe physical damage would be ordered to be removed or protected from such damage. This determination does not consider the area along the underside of the top portion of a metal structural framing member to be an “open area.” Therefore, the determination would not prevent a wiring method from being installed parallel with the underside of the top portion of a metal structural framing member such as a bar joist, junior beam, or “H” beam, etc. provided the wiring method is completely covered by that portion of the structural member.

There has been much discussion amongst the state’s electrical inspectors’ and the electrical industry in the State of New Hampshire regarding the area located below metal roof decks in commercial and industrial applications where there has been a history of physical damage to electrical equipment during roof replacements. This is not to say that damage does not occur during new construction as we are aware of new construction projects where raceways installed prior to roof completion were damaged. The interpretation of the applicable National Electrical Code sections can vary among municipalities. It has been common practice for many years for electricians to install electrical conduit, tubing and cable in the area directly below the roof deck.

Several years ago the Bureau’s electrical inspectors were involved in an incident which occurred at a retail store in the Town of Gorham, NH where the pictures included in this bulletin were taken. A new roof was being installed as part of an upgrading of the structure while the building remained occupied. A situation occurred where sections of the store lighting and roof top air conditioning units were no longer working as the circuit breakers had tripped. After several attempts to reset the tripped circuit breakers, by unqualified personnel, an arc flash occurred. Further investigation uncovered that the Electrical Metallic Tubing (EMT) used to supply the lighting and roof top units had been penetrated by screws used to secure the roof material which caused the circuit breakers to trip. The National Electrical Code (NFPA 70-2005) has been used as a reference. The following items and pictures depict the problems that occurred with the installation:

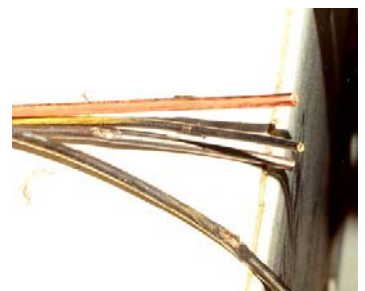
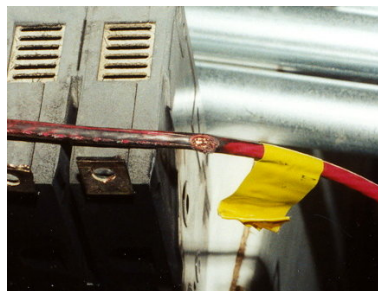
1. The area in question is located just below a steel roof deck. In this case it included the voids in the roof deck material. In this picture you can see the screws used to secure the roofing material that just missed the box and raceway.



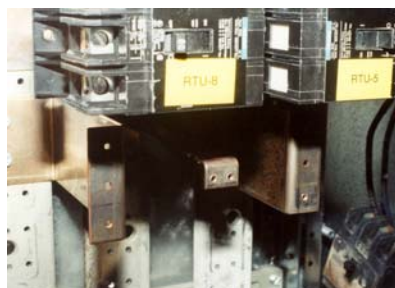
2. There were several raceways that were secured in the area just below the roof deck and the top of the framing members that had been penetrated by the screws used to secure the roofing material.



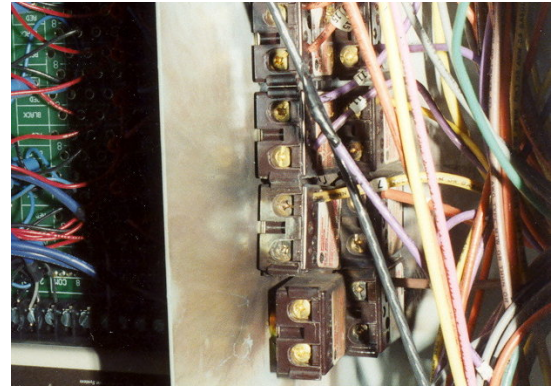
3. Where the screws penetrated the raceways they also penetrated some of the conductors which caused the circuit breakers to trip.



4. There appears to have been arcing between phases and/or between phases and ground, as indicated by the significant amount of carbon, which took out the main fuses before any major damage occurred.



5. There was also evidence of arcing occurring around some of the relays used in the lighting control panel.



Since the above mentioned incident occurred we have learned from licensees, roofing contractors and insurance companies that it is common practice, after these types of roofs have been installed, for electricians to make repairs to electrical equipment that has been damaged by screws used to secure the roofing material to the steel deck. It is also common for manufacturers of the roofing material to require the screws to penetrate the roof deck between a minimum of .75" and a maximum of 4.0" of threads below the steel deck in order to provide a warrantee for wind damage.

There is no specific information included in the National Electrical Code to address this situation and there are only a few general rules regarding issues related to physical damage. Section 300.4 provides some guidance for protection for conductors, cables and raceways but holds no language to address this specific condition. One really has to go into the applicable article for the direct information related to physical damage for the wiring method being considered. For example Electrical Metallic Tubing (EMT) can not be used in areas where it is subject to severe physical damage (Refer 358.12 (1)). It is also true that most cable methods covered in Chapter 3 cannot be located where subject to physical damage. For example; Armored Cable (Type AC) and Metal Clad Cable (Type MC) cannot be located where subject to physical damage (Refer 320.12 (1) for AC Cable and 330.12 (1) for MC Cable).

The NEC does not define what constitutes "physical" or "severe physical" damage. Although, in the Bureau's opinion, it is hard to argue that the area in question is not an area that is subject to severe physical damage. The Bureau's inspectors currently consider this area to be subject to severe physical damage and therefore any wiring method that cannot be used where subject to physical or severe physical damage would not be allowed to be installed in that location.